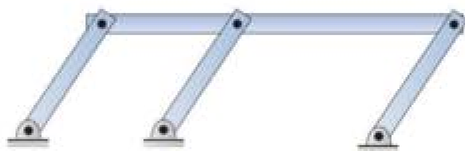
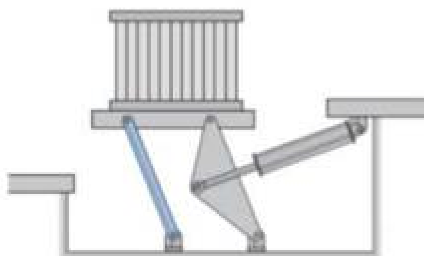
Sheet 1

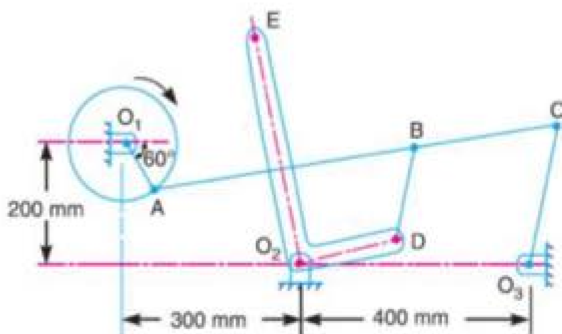
1- Calculate the DOF of each of the following linkages?



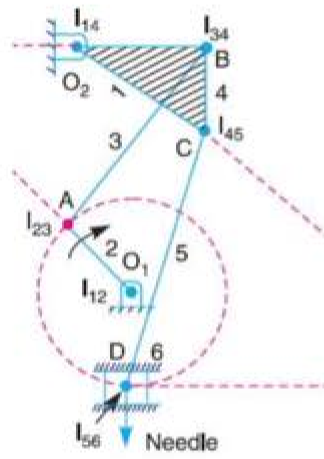
(a)



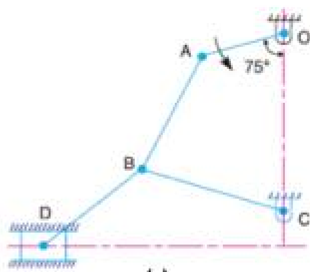
(b)



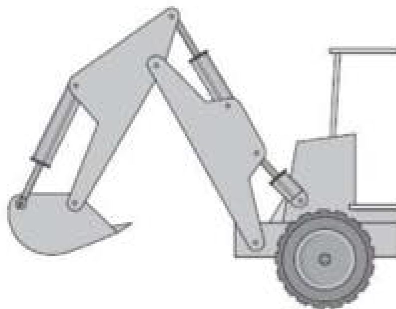
(c)



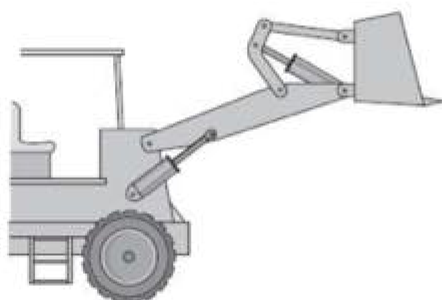
(d)



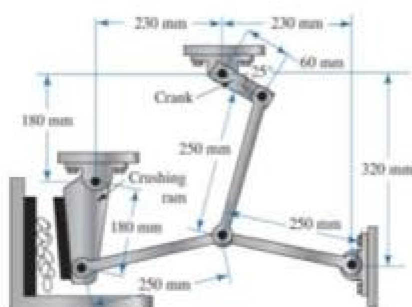
(e)



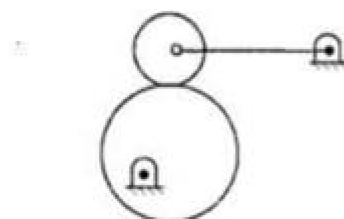
(f)



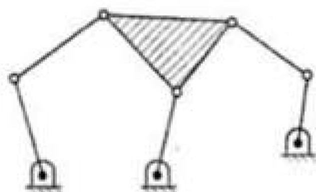
(g)


230 mm
230 mm
60 mm
25°
Crank
180 mm
250 mm
320 mm
Crushing ram
180 mm
250 mm
250 mm

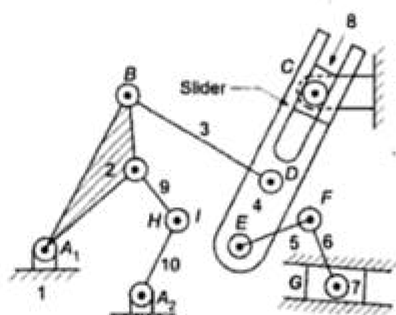
(h)



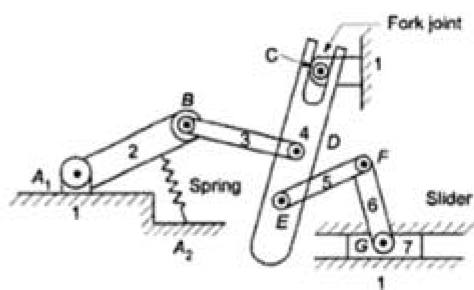
(i)



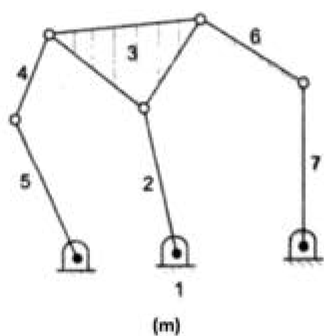
(j)


8
B
C
Slider
3
2
D
9
4
F
H
I
E
5
6
A1
10
G
7
1
A2

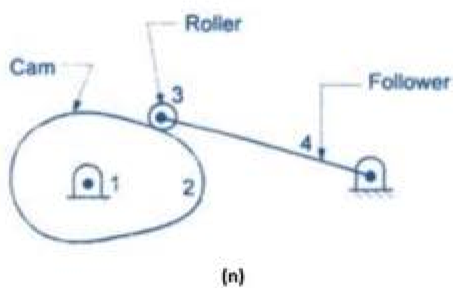
(k)


Fork joint
C
1
B
4
D
2
3
F
A1
Spring
5
Slider
1
E
6
G
7
A2
1

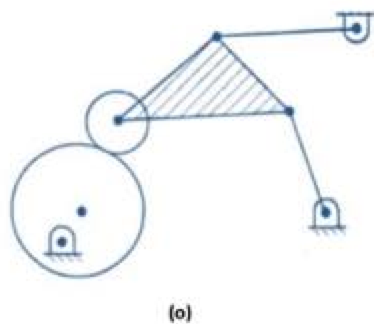
(l)



(m)



(n)



(o)

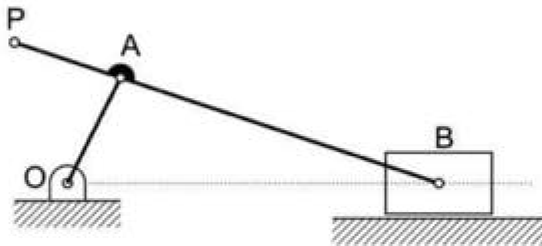
2- The length of the consequent links of a four bar mechanism are 8,6,7,2 cm. Different motions are obtained by fixing one of the links at a time. Plot the relation between the output motion in all the cases.

3- If the largest link is fixed in the previous mechanism, trace the path of a point on the middle of the coupler link. Also, trace the path of a point on the middle of the rocker on a plane rotating with the crank.

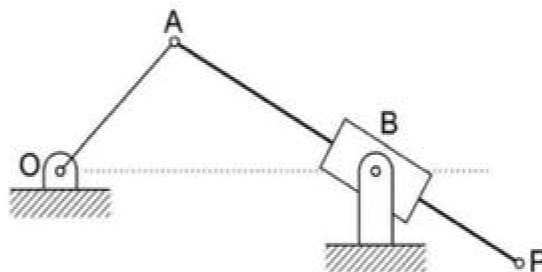
4- The crank in a single slider crank mechanism is 10 cm long and the connecting rod is 40 cm. Trace the path of a point on the middle of the connecting rod.

5- Trace the path of point (P) in the following mechanisms (use scale 1:1) :

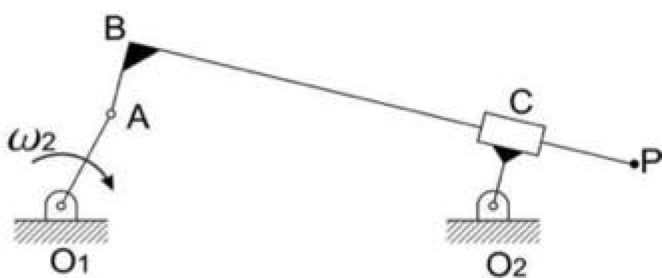
a)



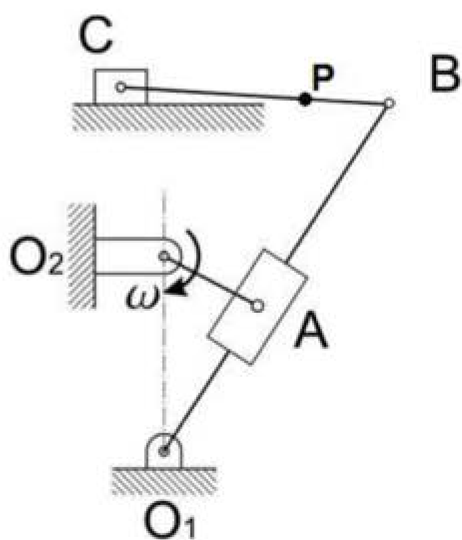
b)



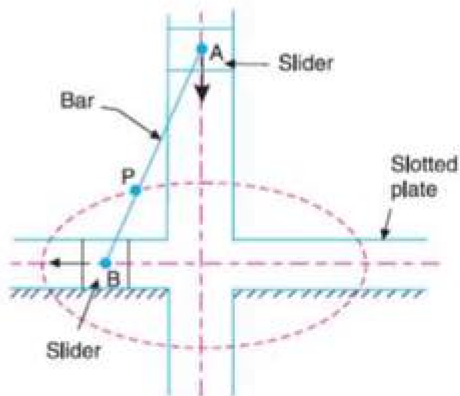
c)



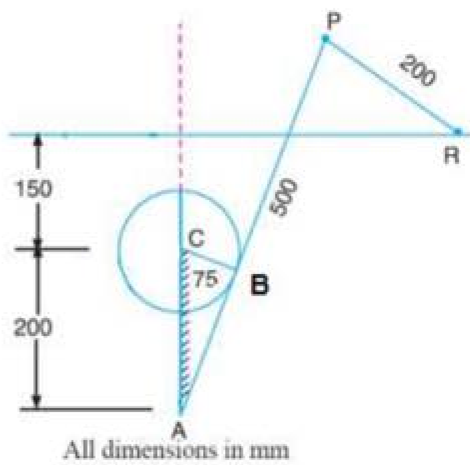
d)



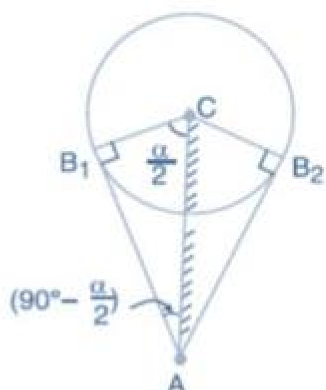
e)



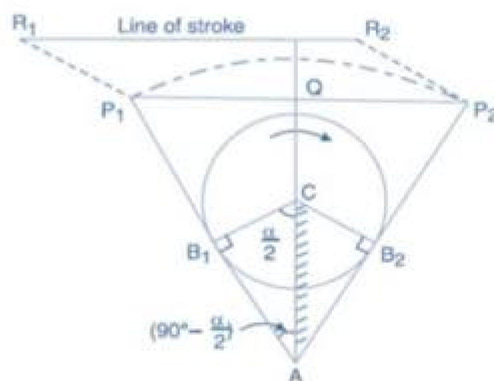
6- For the crank shaper mechanism, obtain the time ratio and the effective stroke.



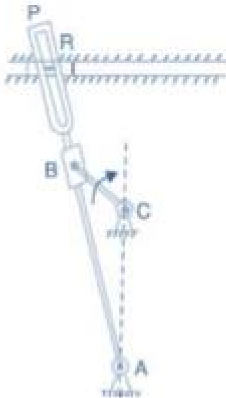
7- A crank and slotted lever mechanism used in a shaper has a centre distance of 300 mm between the centre of oscillation of the slotted lever and the centre of rotation of the crank. The radius of the crank is 120 mm. Find the ratio of the time of cutting to the time of return stroke.

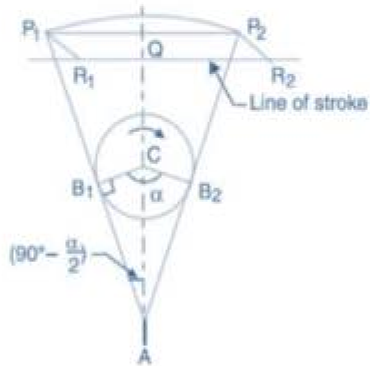


8- In a crank and slotted lever quick return motion mechanism, the distance between the fixed centers is 240 mm and the length of the driving crank is 120 mm. Find the inclination of the slotted bar with the vertical in the extreme position and the time ratio of cutting stroke to the return stroke. If the length of the slotted bar is 450 mm, find the length of the stroke if the line of stroke passes through the extreme positions of the free end of the lever.

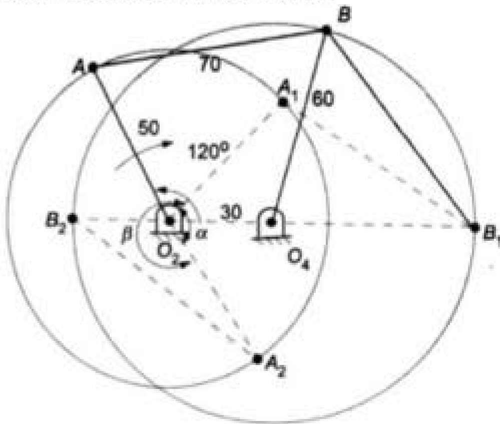


9- The below figure shows the layout of a quick return mechanism of the oscillating link type, for a special purpose machine. The driving crank BC is 30 mm long and time ratio of the working stroke to the return stroke is to be 1.7. If the length of the working stroke of R is 120 mm, determine the dimensions of AC and AP.





10- The configuration of a drag link mechanism shown. Determine the time ratio and the length of stroke, if the crank O2A rotates clockwise.



11- Draw the outline skeleton of the mechanism used in the head of a sewing machine to acuate the needle bar. Draw the displacement diagram for point D on the needle starting from the lowest position and using 16 division. Trace also the path of a point on the middle of CD.

(O_2B= 25 mm , BC=16 mm, O_1O_2(vertical)=45 mm, O_1O_2(horizontal)=12 mm, BA=42 mm , O_1A=16 mm , CD= 50 mm)

